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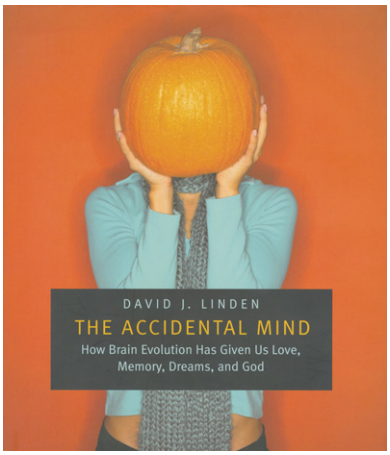
Book Review

Your Brain the Kludge

The Accidental Mind

David J. Linden
Belknap Press (2007).
288 pp., $25.95 hardcover.



Most neuroscientists, and the public at large, speak reverently of the human brain, which is often likened to a supercomputer. They marvel at its complexity and ability to perform even its most mundane tasks. But not David Linden. In his new book, *The Accidental Mind*, he describes the human brain as a kludge, "a design that is inefficient, inelegant, and unfathomable, but nevertheless works."

The Accidental Mind is well suited for a wide audience. Nonscientists and newcomers to neurobiology will appreciate Linden's clearly articulated overviews of such complicated topics as the brain's cellular architecture, neurotransmission, neural development, and the molecular and cellular basis of memory. Linden does an excellent job of providing detail on these subjects, but not so much that the reader feels like the "soul is departing their body" (as he jokes is often the case with neurobiology books). Neurobiologists such as ourselves will find much of the book to be review, but there are enough offbeat stories, colorful examples, and thought-provoking speculations to keep us interested throughout. (It might aid sales if the book were enclosed in plastic with a sticker on the outside advertising: "Want to learn why you can't tickle yourself? Why the genitals don't occupy a larger area of the sensory homunculus? How tooth brushing can provoke orgasms? Buy this book!")

The driving thesis of *The Accidental Mind* is that the human brain is poorly designed. Linden argues that the brain is composed of "crummy parts" that are slow and unreliable and overflowing with "anachronistic junk" left behind by millions of years of evolution. Ultimately, he speculates that these flaws are responsible for many of our uniquely human characteristics, including our predispositions for long-term relationships and religious thought. One problem with these arguments is that they assume we have already figured out how the brain works and are now in position to evaluate its design, or lack thereof. Another problem is semantic; design implies a designer.

But giving credit to evolution, as Linden does, still begs the question: the brain is poorly designed compared to what? Linden compares neuronal conductance to that of copper wire and neuronal firing rates to the computational power of computers, but nonorganic materials are hardly fair comparisons. Human performance on certain tasks, like chess, may be hampered by inferior computational speed, but the problems posed by other games, like the Chinese strategy game go, appear less susceptible to brute force computational methods. Evolution has come up with impressive solutions for difficult problems like image recognition, noise filtering, and adaptation to new environments, all of which pose huge challenges for designers of artificial intelligence. Linden chooses to emphasize the clunkiness of the human brain, but many examples attest to its elegance. Still, in a field known for its paeans to human brain function, Linden provides a refreshing perspective.

The book's subtitle promises an explanation of "How Brain Evolution Has Given Us Love, Memory, Dreams, and God"—a tall order. Linden makes a good case for love, and speculates entertainingly about dreams and God, but lets us down when it comes to memory. In the chapter covering learning and memory, he provides an excellent overview, ranging from cognitive psychology to molecules and LTP, which is suitable for readers with little background in the field. Unfortunately, he also misapplies the book's guiding thesis. Linden argues that the size and complexity of the human brain are necessary to overcome its evolutionary design flaws and that these compensations preclude full prenatal brain development and genetically programmed wiring. No big problem there, but then he proposes that sensory input-dependent changes in synaptic strength (LTP and LTD) and structure (spine plasticity and new synapse formation) exist to accommodate those preclusions. Linden writes, "…our memory… is nothing more than the accidental product of a workaround solution to a set of early evolutionary constraints." This is a head-scratcher. Experience-dependent synaptic changes occur in all organisms with nervous systems; they didn't arise due to the evolutionary pressure of a large and complex brain coupled with a narrow birth canal. Furthermore, the ability to adapt behavior according to past experience is immensely advantageous to the survival of an organism. While love, dreams, and God may very well be accidental byproducts of human brain evolution, we wish Linden had left memory off the list.

Despite its flaws, *The Accidental Mind* has a lot to offer. It's well written, thoroughly entertaining, and an excellent introduction to neurobiology. It would make a great gift for that friend or relative who is always curious about your work, but hasn't had the time or courage to read

about it. Neurobiologists will enjoy Linden's willingness to tackle difficult questions from a contrarian viewpoint. He chooses to emphasize the human brain's flaws over its triumphs, which makes for some awkward arguments, but every highly evolved organism needs some humbling now and then.

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